REMARKS/ARGUMENTS

After the foregoing Amendment, Claims 45, 47-48, 50-51, 53-54, 59, 61-64, 69-70, 74, 76, and 80-88 are currently pending in this application. Claims 46, 49, 52, 55-58, 60, 65-68, 71-73, 75, 77-79 have been canceled without prejudice. Claims 45 and 59 have been amended to include the feature of the base station having a selectively operable beamforming antenna configured to receive a relative location of the mobile unit with respect to the beamforming antenna and direct beacon channels toward the mobile unit location to receive an omnidirectional sounding pulse. Claims 74 and 83 have been amended to include the feature of the mobile unit having a selectively operable beamforming antenna configured to determine a relative location of the selected handover base station with respect to the beamforming antenna based on information related to the detected sounding pulse and continue the wireless communication of the mobile unit via the selected handover base station forming a communication beam toward the selected handover base station. Various amendments have been made to claims 45, 47-48, 50-51, 53-54, 59, 61-64, 69-70, 74, 76, 80, and 83-88 to improve readability of the claims. Applicants submit that no new matter has been introduced into the application by these amendments.

Claim Rejections - 35 USC §103(a)

Claims 45 and 59 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (US Patent No. 6834192) in view of Jollota et al. (US Pub. No. 2004/0142691). Claims 69, 74, 83, and 85 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. and Jollota et al. in view of Velazquez et al. (US Patent No. 6593880). Claims, 84 and 87 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. and Jollota et al. in view of Anderson et al. (US Patent No. 5396541). Claims, 47, 53-54, 61, 64, 70, 74 and 88 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. and Jollota et al. in view of Keskitalo et al. (US Patent No. 5893033). Claims, 50, 63, 76, and 80-82 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. and Jollota et al. and Bark et al. (US Patent No. 6445917) in view of Keskitalo et al. Claim 51 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. and Jollota et al. in view of Bark et al. further in view of Velazquez et al. These rejections are respectfully traversed with respect to the amended claims.

The present claims are directed to a method and apparatus for handover of a wireless communication with a mobile unit by addressing the specific challenges of signaling a handover, locating a handover base station and executing a handover in a wireless communications system where mobile units and base stations communicate via beamforming antennas.

According to the present claims, a mobile unit emits an omnidirectional sounding pulse in response to a handover trigger to notify nearby base stations that it is seeking a handover base station. For base stations equipped with beamforming antennas, the reception beams of the base stations must be pointed in the direction of the mobile unit in order to receive the omnidirectional sounding pulse. Thus, prior to the sending of the sounding pulse, the interface provides mobile unit location information to the base stations in response to the handover trigger, and the base stations direct their beams toward the location of the mobile unit to receive the sounding pulse. Without the participation of the interface to provide location information of the mobile unit, certain candidate base stations communicating via directional beamforming antennas may not be discovered, which may result in a failed handover or loss of connectivity for the mobile unit.

Watanabe et al. teaches a method and apparatus for effectuating a handover in a radio communication system. According to Watanabe et al., the mobile device determines the need for a handover by measuring power levels of signals

transmitted by access points (base stations) in its area. The mobile unit sends an INQUIRY message to a selected access point with which it wants to communicate, and the access responds with address information.

Jollota et al. teaches a technique for connection initiation in wireless networks where a mobile unit sends an Inquiry packet, such that nearby base stations that are in an inquiry scan state receive the Inquiry packet from the mobile unit. As asserted by the Examiner, Watanabe et al. and Jollota et al. do not consider base stations equipped with beamforming antennas such that the beamforming antennas need to be directed to the location of the mobile unit in order to receive the Inquiry packet transmitted by the mobile unit.

Velazquez et al. teaches a wireless communication system employing directive antenna arrays where base stations and mobile units employ position knowledge to direct narrow antenna beams toward desired users. According to Velazquez et al. (see Fig. 8 and Column 6, line 38 to column 7, line 8), upon initial establishment of a wireless link between a mobile unit and a base station, the mobile unit and base station exchange position information in order to direct beams toward each other. This exchange of location information differs from the present claims where an interface detects a handover trigger and provides information to the base stations to direct their beams to receive the sounding pulse for handover selection prior to establishment of a wireless link. Thus, Velazquez et al. does not

teach the feature of the present claims of providing, in response to a handover trigger, a mobile unit location from an interface to candidate base stations in order to direct their antenna beams to receive an omnidirectional sounding pulse.

Keskitalo et al. teaches a wireless communication system where base stations communicate via directional antennas and where the terminal equipment (mobile unit) maintains and updates a list of potential serving base stations by continuously monitoring and measuring signals emitted by nearby base stations. According to the present claims, no list of candidate base stations for handover is maintained at the mobile unit as done in Keskitalo et al. Instead, upon detection of a handover trigger for a mobile unit, an interface notifies the base stations of the mobile unit location so that the base stations may direct their antenna beams to detect the sounding pulse. The detected sounding pulse information is then used to select a base station for handover. The technique of using of a sounding pulse to locate a handover base station, as per the present claims, is more energy efficient than the base station monitoring technique of Keskitalo et al. because it does not require the mobile unit to continuously monitor and measure signals from nearby base stations. Moreover, the base station monitoring technique according to Keskitalo et al. does not enable the mobile unit to discover candidate handover base stations that do not currently have a beam directed toward the mobile unit, as in the present claims.

Claim 59 (and similarly claim 45) requires:

> ...
> the base station configured to receive from an interface in response to a detected handover trigger for a mobile unit a relative location of the mobile unit with respect to the beamforming antenna of the base station;
> the beamforming antenna configured to direct beacon channels toward the mobile unit location to receive an omnidirectional sounding pulse;
> ...

(Emphasis added.)

As explained above, Watanabe et al., Jollota et al., Velazquez et al. and Keskitalo do not teach or suggest a technique for handover between base stations with beamforming antennas where an interface notifies the base stations of the location of a mobile unit, in response to a handover trigger, so that the base stations may direct their beams to the mobile unit location to detect a mobile unit emitted sounding pulse. Moreover, further references Anderson et al. and Bark et al. do not correct these deficiencies. Accordingly, the cited references do not teach the features of independent claims 45 and 59.

Claims 47-48, 50-51, 53-54, 61-64 and 69-70 are dependent upon claims 45 and 59 which the Applicants believe are allowable over the cited prior art of record for the same reasons provided above.

Present claims 74 and 83 are directed to a method and apparatus of a mobile station with a selectively operable beamforming antenna to transmit an omnidirectional sounding pulse in response to a triggering event, to receive directed communication beams from base stations that detected the sounding pulse, to select a handover base station from among the base stations that detected the sounding pulse, and to direct a communication beam to the location of the selected base station based on information related to the detected sounding pulse. Therefore, present claims 74 and 83 require a mobile unit to first communicate omnidirectionally via a sounding pulse to advertise that it is seeking a handover base station, and then to direct a beam toward the selected handover base station using the relative location information provided in response to the sounding pulse.

As explained above, Watanabe et al. and Jollota et al. do not disclose the use of beamforming antennas, nor do they teach selecting a handover base station and completing a handover using a directed beamforming antenna at a mobile unit. In particular, Watanabe et al. and Jollota et al. fail to teach or suggest determining a relative location of a selected handover base station based on information related to the detected sounding pulse and continuing wireless communication of the mobile unit via the selected handover base station by directing a beam toward the location of the handover base station. Velazquez et al. teaches providing location information from a base station to a mobile unit for directing a beamforming

antenna, however, this is done after a wireless communication link is established between the base station and the mobile unit. In contrast, the present claims teach providing relative location information of the base station to the mobile unit before the handover base station has been selected, so that the mobile unit can immediately communicate with the selected base station upon choosing one of the base stations that detected the sounding pulse as the handover base station.

Keskitalo et al. teaches terminal equipment (mobile unit) maintaining and updating a list of potential serving base stations, and does not disclose the use of a sounding pulse where relative location information of potential handover base stations is provided to the mobile unit in response to the sounding pulse.

Claim 74 (and similarly claim 83) requires:

> ...
> transmitting an omnidirectional sounding pulse from the communicating mobile unit during the wireless communication upon the occurrence of a triggering event, the omnidirectional sounding pulse being detectable by base stations whose geographic coverage area includes the mobile unit in order to establish wireless communication with the mobile unit;
> receiving directed communication beams beam from base stations detecting the sounding pulse at the mobile unit;
> selecting a handover base station from the base stations that detected the sounding pulse based on the communication beams received by the mobile unit; and
> determining a relative location of the selected handover base station with respect to the beamforming antenna of the mobile unit based on information related to the detected sounding pulse; and

> continuing the wireless communication of the mobile unit via the selected handover base station whereby the continuing the wireless communication of the mobile unit via the selected handover base station includes operating the mobile units beamforming antenna to form a communication beam toward the selected handover base station based on the relative location of the selected handover base station.

As explained above, Watanabe et al., Jollota et al., Velazquez et al. and Keskitalo et al do not teach the features of present claims 74 and 83. Further references Anderson et al. and Bark et al. also do not correct these deficiencies. Accordingly, the cited references do not teach the features of independent claims 74 and 83.

Claims 76, and 80-88 are dependent upon claims 74 and 83 which the Applicants believe are allowable over the cited prior art of record for the same reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C. §103(a) rejection of claims 45, 47-48, 50-51, 53-54, 59, 61-64, 69-70, 74, 76, and 80-88 is respectfully requested.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this

application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 45, 47-48, 50-51, 53-54, 59, 61-64, 69-70, 74, 76, and 80-88, are in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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